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AN EXAMINATION OF *Dr. WOODWARD's* Account of the *Deluge*, &c.

With a Compariſon between STENO's Philoſophy and the DOCTOR's, in the Caſe of Marine Bodies dug out of the Earth.

By *J. A.* M. D.

BIBLIOTHECA BODLEIANA

WITH A

LETTER to the Author CONCERNING An ABSTRACT

Of AGOSTINO SCILLA's *Book on the ſame Subject, Printed in the* Philoſophical Tranſactions.

By *W. W.* F. R. S.

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THE PREFACE.

I Shall make no Apology for the Remarks, ſince the unqueſtionable Liberties of the Common-Wealth of Learning allow me the ſame Priviledg of examining, as they do the Doctor of propoſing his Hypotheſis; and I am ſo far from having given the Doctor any juſt cauſe of Offence, that I ſhall rather believe I deſerve his Thanks; for ſince he has ſet up his Eſſay as the Model of a larger Structure, he ought to be ſuppos'd rather to invite than diſcourage thoſe who may point at any Faults which afterwards it may be too late to correct: The Citations out of Dr. Woodward

and Steno *may seem tedious, but they were necessary; for after such heavy and unjust Charges of Mis-representing, which had appear'd in some Matters relating to this Controversie, I durst not venture out of the beaten Road of Verbal Quotation. After I had finish'd these few Remarks, my Worthy Friend Mr.* Wotton, *well known for his Parallel of Ancient and Modern Learning, sent me a Vindication of his Account of* Agostino Scilla, *with a Permission to publish it, tho I wish he had allowed me to scratch out some things, which have no other ground than his Civility.*

ERRATA.

Preface, l. 2. r. following Remarks; p. 20. l. 1. powder, r. powder'd; p. 23. l. 13. 132, r. 232; p. 24. l. 26. r. If I; p. 25. l. 8. vegetable, r. vegetative; page 30. l. 29. so inconsistent, r. inconsistent.

AN.

AN EXAMINATION OF *D'WOODWARD's* ACCOUNT OF THE DELUGE, *&c.*

THAT the Reader may have a true Notion of Dr. *Woodward's* Hiſtory of the Deluge, he may take the following Account, in his own Words.

1. 'That at the Time of the Deluge, P. 164. 'the Water of the Ocean was firſt born 'forth upon the Earth; that it was immedi-

'ately ſucceeded by that of the Abyſs,
'which likewiſe was brought out upon the
P. 109. 'face of the Globe. How this Water was
'rais'd at the Deluge? by what Iſſues or
'Out-lets it came forth? what ſucceeded
'into the room of it while abſent? the
'Author ſays he will tell us in his larger
'Work.

Preface. 2. 'That the whole Terreſtrial Globe
'was taken all to pieces, and diſſolv'd at
'the Deluge; the Particles of Stone, Mar-
'ble, and all other ſolid Foſſils diſſever'd;
P. 74. 'their conſtituent Corpuſcles all disjoin'd;
'their Coheſion perfectly ceaſing; that the
'ſaid Corpuſcles of thoſe ſolid Foſſils, to-
'gether with the Corpuſcles of thoſe which
'were not before ſolid, ſuch as Sand, Earth,
'and the like; (*he means the leſſer Solids,
'for Sand and Earth are not Fluids:*) as
'alſo all Animal Bodies, and Parts of Ani-
'mals, Bones, Teeth, Shells, Vegetables,
'and Parts of Vegetables, Trees, Shrubs,
'Herbs, and, to be ſhort, all Bodies what-
'ſoever that were either upon the Earth,
'or that conſtituted the Maſs of it; if not
'quite down to the Abyſs, yet at leaſt to the
'greateſt depth we ever dig: (*that is, if not
'to the Depth of two thouſand Miles, at leaſt
'of two hundred Feet*) *but the reſt of the Hypo-*

'*theſis*

theſis, and the former Part of the Paragraph,
does not ſuffer this to be any Doubt: for
'the whole Terreſtrial Globe was diſſol-
'ved:) I ſay, all theſe were aſſum'd up
'promiſcuouſly into the Water, and ſu-
'ſtained in it in ſuch manner, that the Wa-
'ter and Bodies in it together made up
'one common confus'd Maſs. What was *p.* 107.
'the immediate inſtrument or means where
'by the Stone and other ſolid Matter of
'the antediluvian Earth was diſſolv'd;
'why the Shells, Teeth, Bones, and o- *p.* 108.
'ther parts of Animal Bodies, as alſo the
'Trunks, Roots, and other parts of Vege-
'tables were not diſſolv'd as well as the
'Stones and other mineral Solids of that
'Earth, the Author has promiſed a Reaſon
'in his larger Work.

3. 'That, at length all the Maſs that *p.* 7.
'was thus born up into the Water was a-
'gain precipitated, and ſubſided towards
'the Bottom; that this Subſidence hap-
'pen'd generally, and as near as could poſ-
'ſibly be expected in ſo great a Confuſion,
'according to the Laws of Gravity: that
'Matter, Body or Bodies, which had the
'greateſt quantity or degree of Gravity,
'ſubſiding firſt in order, and falling loweſt:
'that which had the next, or ſtill a leſſer

'degree of Gravity, ſubſiding next after,
'and ſettling upon the precedent; and ſo
p. 108. 'on in their ſeveral Courſes. But the *Ter-*
'*reſtrial Matter* that firſt ſubſided, did not
'deſcend down quite to the Centre, and fill
'up the Cavity of the great Abyſs, but
'ſtop'd at that diſtance from it, forming an
'arch'd Expanſum, or rather a Sphere a-
'round it; which is now the loweſt Stra-
'tum and Boundary of that vaſt Concepta-
'cle of Water. Of this likewiſe the Author
'will aſſign a Reaſon in his larger Work.

p. 79. 4. 'That the *Strata* of Marble, of Stone,
'and of all other ſolid Matter, attain'd
'their Solidity, as ſoon as the Sand, or o-
'ther Matter whereof they conſiſt, was ar-
'riv'd at the Bottom, and well ſettled there.
p. 109. 'The Reaſon of this too is reſerv'd for
'the larger Work.

p. 30. 5. 'That this very various Miſcellany
'of Bodies being determin'd to Subſidence
'in this order, meerly by their different
'ſpecifick Gravities, all thoſe which had
'the ſame degree of Gravity, ſubſided at
'the ſame time, fell into and compos'd the
'ſame Stratum; ſo that thoſe Shells and
'o her Bodies that were of the ſame ſpeci-
'fick Gravity with Sand, ſunk down toge-
'ther with it, and ſo became inclos'd in the
'Strata

'Strata of Stone, which that Sand form'd 'or conſtituted; thoſe which were lighter 'and but of the ſame ſpecifick Gravity 'with Chalk, in ſuch places of the Maſs 'where any Chalk was, fell to the Bot-'tom at the ſame time that the chalky Par-'ticles did, and ſo were entomb'd in the 'Strata of Chalk; and in like manner all 'the reſt: that accordingly we now find 'in the Sand-ſtone of all Countries (the 'ſpecifick Gravity of the ſeveral ſorts 'whereof is very little different, being ge-'nerally to Water as $2\frac{1}{4}$ or $2\frac{2}{5}$ to 1.) only 'thoſe *Conchæ*, *Pectines* and *Cochleæ*, and 'other Shells that are nearly of the ſame 'Gravity, *viz.* $2\frac{1}{2}$ or $2\frac{3}{8}$ to 1. But theſe are 'ordinarily found incloſ'd in it, in pro-'digious Numbers; whereas of Oyſter 'Shells (which are in Gravity but as about '$2\frac{1}{3}$ to 1.) or the other lighter ſort of Shells, 'ſcarce one ever appears therein; but on 'the contrary, in Chalk, which is lighter 'than Stone, being but as about $2\frac{1}{5}$ to 1.) 'there are only found *Echini* and other 'lighter ſort of Shells, &c.

6. 'That the *Strata* thus form'd, whe- p. 8c.
'ther of Stone, of Chalk, of Coal, of 'Earth, or whatever other Matter they 'conſiſted of, lying thus upon each other,

'were all originally Parallel; that they were
'plain, even and regular; and the Surface of
'the Earth likewise even and spherical; that
'they were continuous, and not interrupted
'or broken; and that the whole Mass of the
'Water lay then above them all, and consti-
p. 80. 'tuted a fluid Sphere environing the whole.

7. 'That after some time, the *Strata* were
'broken on all sides of the Globe; that they
'were dislocated, their Situation vary'd, be-
'ing elevated in some places and depress'd
'in others; that all the Irregularities and
'Inequalities of the terrestrial Globe, were
'caused by this means; that the Agent or
'Force which effected this dislocation of
p. 129 'the *Strata*, was seated within the Earth;
'but what that Agent was, the Author has
'promised to tell us in his larger Work.

8. 'That upon the Disruption, of the
p. 164. '*Strata*, and the Elevation of some, and
'Depression of others of them which fol-
'low'd after that Disruption towards the
'the latter End of the Deluge, this Mass
'of Water fell back again into the depress
'and lower Parts of the Earth, into Lakes
'and other Cavities; into the *Alveus* of the
'Ocean, and thro' the Fissures whereby
'this communicates with the Ocean, into
'the Abyss, which it fill'd till it *came to an*
'*Equilibrium with the Ocean.* The

The Author deduces the Water of Springs from the great Abyss, by *subterranean* Heat, which evaporates and elevates its Water, buoying it up indifferently on every side. p. 121

Here indeed as the Doctor says, *We see a mighty Revolution, and that attended with Accidents very strange and amazing; a change so exceeding great and violent, that the very Representation is enough to startle and shock a Man:* but of the five or six surprising Alterations here describ'd, the Doctor has only given us the Philosophy of one; he has baulk'd our Expectation in the most material Points; *viz.* What brought the Water of the Abyss upon the Surface of the Globe? What succeeded in its room? What dissolv'd the Fossils? and at the same time spared the Animal and Vegetable Substances? What stopt the precipitated Matter in the Descent, so that it did not fill up the Cavity of the great Abyss? by what means the *Strata* attain'd their Solidity so soon as the Matter whereof they consisted, was arriv'd at the Bottom? What effected the Disruption of the *Strata*? All these the Doctor has tickt for; putting us off at this time only with the Reason why the *Strata* ran- p. 82.

ged themſelves in their preſent Order; *viz.* the different Gravity of the Matter whereof they conſiſt. I wiſh at the ſame time he had not told us things of leſs moment. But whatever his Reaſons may be for deferring to explain himſelf in theſe Particulars, I will ſo far contribute to the making the larger Work more perfect, as to give the Doctor an Opportunity of clearing ſome Difficulties which ſeem to me to lie in his way. To begin then;

The Alterations of the Earth, here deſcrib'd, appear to be all of them above the Power, and contrary to the Laws of Nature, and conſequently exclude the Philoſophy of Second Cauſes.

Firſt, the Water of the Abyſs is brought upon the Surface of the Earth, contrary to its natural Gravity; this I think can only be done two ways; either by Pulſion or Attraction. The firſt is made uſe of by the Learned Author of the Theory, who raiſes the Water by the falling in of the external Cruſt: but it is plain the Doctor makes uſe of no ſuch Inſtrument, ſince his Diſſolution of the Earth happen'd after its being cover'd with the Water. *For the Water was all out upon the Surface of the Earth, before ever the Terreſtrial Parts*

p. 181.

ſtir'd.

stir'd. The latter, (I mean the Attraction of a heavenly Body) is made use of by a late ingenious Writer; but, besides that the Doctor seems to take no notice of it, this will not do the business after his manner.

It must be acknowledg'd that almighty Power can do this and much more; and as *Steno* says, *If the Motion of an Animal can effect that, according to Pleasure, Places that are now overwhelm'd with Water shall be render'd dry; and by and by be drowned again by new Waters; why should we not be ready to grant to the first Mover of all things the like Liberty?* But then I would no more undertake to explain this, than how the Dead are rais'd. *Prod. transl. p. 103.*

The second Difficulty is, the making a Body lighter than Water descend into the Cavity of the great Abyss in the place of the Water which had ascended: what Body this was, is a Secret the Doctor did not think us ripe for as yet; however we may be allow'd to guess. There is a Body somewhere about the Earth, it is neither any part of the Solids, nor the grosser Fluids of the terraqueous Globe; what Body is that? I dare not be positive, but I'll lay an even wager 'tis Air: so far is certain,

certain, it must be lighter than Water, and so the Difficulty remains.

The next Miracle is, the Dissolution of all Solids (except Vegetable and Animal Substances) into their *constituent Parts*; of this the Dr. says he will assign a plain Physical Reason. I must beg his pardon if I think it cannot be very plain. I will not trouble my self any more with guessing, but this I know, if any Man besides the Doctor should have pretended to such a Secret, it would have found the same Credit as the Philosophers Stone, Circular Shot, *Perpetuum Mobile*, or some such *Chimera*. But against the Dissolution of Solids, I have these two Objections.

1. If the Cohesion of all Solids perfectly ceas'd, and their constituent Corpuscles were disjoin'd, why were not those of Sand, Gravel, and Earth so too? for they are little Solids, and have their constituent Parts as well as the larger; and what dissolves the one will dissolve the other.

2. Had this Earth been so dissolved only as far as the Roots of the greatest Plants reach, we must have lost most of the *Species*'s of Plants which were before the Deluge. The Doctor tells us, That after the

the Subſidence, * *Trees, and the other more tender Vegetables, Shrubs and Herbs would rot and Decay; but the Seeds of all kinds of Vegetables being by this means repos'd, and, as it were, planted near the Surface of the Earth, in a Convenient and Natural Soil, amongſt Matter proper for the Formation of Vegetables, would germinate, grow up and replenish the Earth.* But the Seeds of all kinds of Vegetables could not be preſerved, for ſome Plants had not as yet ſeeded at the time of the Deluge, or at leaſt had ſeeded ſo long before as to have made ſome Progreſs in Vegetation; which I think, being the tendereſt Vegetables muſt have rotted and decayed after the Waters were off. Now, the Deluge happening, according to the Doctor, in the Month of *May*, few Plants muſt have remain'd, but ſuch as were ſeeded the beginning of that Month, or the latter end of *April*, which are but a ſmall part of the whole in moſt places of the Earth. I ſaid, Few muſt have remain'd, and will not be ſo cruel as the Doctor to cut All off; for perhaps one Plant of a thouſand might be ſo hardy, after it had ſettled upon the Ground, to ſpring up again; and it is poſſible to preſerve

* p. 78.

preſerve Seeds at a great depth in the Ground: but the Propagation of all Vegetables could not be truſted to ſuch Accidents. But further, let us conſider that thoſe Seeds which were ripe at the Deluge, floated for a conſiderable time in Water, among diſſolv'd Minerals, enough to ſpoil their Texture, ſo as to render them for ever unfit for Vegetation. I believe the Barly, after the Waters were off, would have made better Malt than Seed Corn; and *Noah* might have made merry with Strong Beer rather than ſtaid ſo many Years till Vines grew up. The Fiſhes in my Mind muſt have fared no better than the Plants. We might have had ſtore of Eels left us, and other Fiſhes that can live in Mud; but ſince, according to the Doctor, * *the far greateſt part of all kinds of Fiſh ſuffer'd under the Fury of the Deluge*, I cannot ſee but whole Kinds as well as Individuals, muſt have periſh'd without a new Miracle: but then the ſame Providence that would make uſe of extraordinary Means to preſerve Fiſhes amongſt Mud, could have ſav'd the no leſs innocent Land Animals in Water. Upon the whole, if Matters had been ſo carried on, I cannot ſee why, amongſt other

* p. 61.

Stowage,

stowage, *Noah* ought not to have had a Green-House and Fish-pond.

I come now to the fourth miraculous Change, which is the assuming up, and sustaining the Solids in Water. I am aware that a *Menstruum* will dissolve a small Quantity of Metal heavier than it self, and sustain it; that Water will dissolve some things heavier, such as Salts and Gums, till it is saturated; and that Sand and Mud thrown into it in small Quantities, will sink at leisure; especially if it be agitated with a violent Motion; but that the Water should take up, and sustain the whole Mass of heavy Solids, down to the Cavity of the great Abyss, most of which exceed it so much in specifick Gravity seems to me as miraculous as the swimming of *Elisha*'s Ax; and as little the Subject of Reasoning and Philosophy. Yea, some of them were not only sustained, but carried many hundreds of Miles in a horizontal Line, such as the heavier sorts of Shell Fishes, that could not transport themselves thither by their Animal Motion. Yea, these Kinds which are called ἐμβύθιοι, and, according to the Doctor, are *never removed, by the greatest Storms, from the Bottom of the Ocean.* N. H. p. 86.

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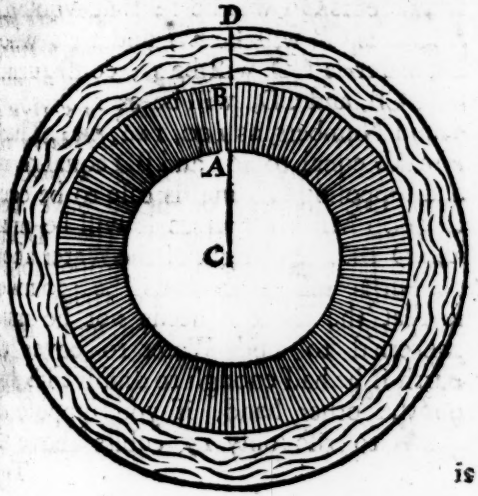
This plainly follows from what the Doctor says, for * *the Sea was of the same Bigness and Capacity before the Deluge as now, and of the same Form also; that there was Sea in or near the same Parts of the Globe.* But against this Mixture of Solids and Fluids, there lies another scurvy Objection. The Doctor tells us, † *that to put a Stop to the Insults and Detractions of vain Men,* [who will not be satisfied there was Water enough to over-top the highest Mountains] *in one of the Sections of the Third Part of his larger Work, he enquires what Proportion the Water of the Globe bears to the Earthy Matter of it; but there being so great an Apparatus of things only previous, which must be adjusted before he could come to the Calculation, &c. he could not then descend to Particulars, lest he should carry that Discourse beyond all reasonable Bounds.* I think this Enquiry ought to have been previous to all others: the Doctor should have calculated the Proportions of his Drugs before he mix'd them. The chief thing to be adjusted here, is, *In a Mixture of a Fluid and dry Solids, what Proportion the Fluids ought to bear to the Solids, so as to make the Compositum attain a certain Degree of Fluidity?* I may venture to say

* p. 253.

† p. 163.

say that this *Aquæ Q. S.* will be at least triple of the Solid Matter, so as to make it attain any reasonable Degree of Fluidity. At first view I found this would press the Doctor's Hypothesis with a great Difficulty; but I went on, and putting the case in the fairest Extreme, suppos'd, in the Mixture of the Deluge, the Quantity of Water equal to that of the Terrestrial Matter, (I mean not in Weight but in Bulk;) then at the time * *when the Water was upon the Face of the Earth, and before the Terrestrial Parts had stirr'd.* * p. 261.

Let the inward Sphere whose Diameter



is

is CA, repreſent the Cavity of the great Abyſs, now deſerted by it, and fill'd with ſome unknown Matter: the Anulus whoſe Thickneſs is AB, the ſolid Cruſt: and the Annulus whoſe Thickneſs is BD, the Water above, (I leave the outward Inequalities of the Surface of the Earth, and the inward of the Cavity of the Abyſs, to compenſate one another.) Theſe three by Suppoſition are equal (bating the ſmall Addition of the Water which was before upon the Surface of the Globe) *viz.* the Water, the Space where the Water was, and the Solid Matter. Then the Sphere whoſe Diameter is CA will be 1; that whoſe Diameter is CB will be 2; and that whoſe Diameter is CD will be 3; conſequently CA, CB, and CD, will be as 1, $\sqrt[3]{2}$, $\sqrt[3]{3}$. in round Numbers, as 100, 126, 144. Therefore AB eqnal to 26, and BD equal to 18, and ſuppoſing CD in this caſe to be equal to 3600 Miles (whereas it will be much more) BD, the height of the Water above the Surface of the Earth will be 450 miles: ſo that the Doctor needs not be much concern'd to find Water to cover the Earth if he had enough to diſſolve it: but, on the other hand, if you ſuppoſe the Water to riſe only 15 cubits above the

Tops

Tops of the higheſt Mountains, it will not make $\frac{1}{240}$ of the Solid Matter, which is too little to make the Earth into an Electuary, nay hardly into a Pill. Here it muſt be remember'd, that Dr. *Woodward* aſſerts, that the *Æquilibrium* is kept between the Terreſtrial Parts and the Water, and that there is no Tranſmutation of the one into the other. But the ſtrangeſt thing, and, if I may ſo ſpeak, the Miracle of all Miracles is, that the Water and Solid Matter now mixt together, ſhould either float upon a Vacuum, or the Subtil Matter that came in place of the Water of the Abyſs; for in the internal Sphere whoſe Diameter is CA, there is neither Water nor Solid Matter, but it muſt be left as it is for the Solid Matter to form the *Arched Expanſum* upon. This is turning Nature outſide inward; the Bottom of the Ocean is now ſupported by Water, and the Water by the Air. Well, if the Dr. gives a Reaſon for this too, adieu Hydroſtaticks. p. 40.

I am now come to the Subſidence of the Matter of the Strata, and the ranging them in the preſent Order: and this preſents us with a moſt ſurpriſing Effect, which the Dr. has promiſed us the Reaſon of; *viz. Why the Terreſtrial Matter that firſt*

ſubſided, did not deſcend down quite to the Centre, and fill up the Cavity of the great Abyſs? Firſt here muſt be Matter exactly of the ſame Specifick Gravity, to make it deſcend with the ſame Celerity, and arrive at the ſame diſtance from the Centre in the ſame inſtant. Next, all theſe looſe Particles, as by a Confederacy, muſt ſtop ſhort; then when they had ſunk quite down into the Water, the denſer Fluid, they halt at the Confines of the ſubtiler Fluid, now lying about at the Centre; They all harden into a Cruſt in the ſame inſtant, and form an Arch of at leaſt 2500 miles diameter; This Arch is neither broke by its own weight, nor that of the ſucceeding Strata. God forbid I ſhould limit Omnipotency, but as to the Second Cauſes, I muſt remain an Infidel till the Doctor's larger Work appears. I am ſure *Steno*'s Rule of forming the Strata is more conformable to the known Laws of Nature. *At the time that any Bed was formed, there was another Body under the ſame Bed, which did hinder the farther Deſcent of that duſty Matter, and conſequently at the ſame time that the loweſt Bed was formed, there was under it either another ſolid Body; or, if ſome Fluid was there, it was both of a different*

Prod. p. 42.

different nature from the upper Fluid, and heavier than the Solid Sediment of the ſuperiour Fluid. But this Notion of the Subſidence performed according to the different Degrees of Specifick Gravity, being the only piece of Philoſophy the Dr. has gratified us with at preſent, I ſhall conſider it more fully. And

Firſt, I ſay, Obſervations of the Specifick Gravity of Bodies in the Circumſtances required, and to the Nicety pretended, ſeem altogether impracticable. For we muſt remember that the Medium in which the undiſſolved Subſtances were floating, was not common Water, but a Medium (by reaſon of the mixture of Solid Matter) of an unknown Denſity, perhaps thicker than a Quagmire. This I believe will appear pretty clear from what has been hinted above, about the Proportion of the Fluids and Solids.

Next, it is extremely hard to find the Specifick Gravity of Bodies reduced into ſmall Particles, ſuch as Sand and Earth. Now, the Minerals, when diſſolved, were reduced either into their Elements or Powders. If the latter, I cannot ſo well apprehend how, by a mixture with Water, they could form Maſſes of the ſame Mine-

ral again: for I think if Powder, Chalk, Flint, Marble, or any of those things of which the Strata are compos'd, should be mixed with Sea water, they will not be bak'd again into a Mass of the same Nature as soon as they arrive at the bottom; but if the Solids were reduced into their Elements, which I think the Dr. means by *their constituent Parts*, it is hard to tell what Specifick Gravity those would have: it is probable not the same with their Composita, which require a Mixture of heterogeneous Matter to make them up. Then it is very difficult to find the Specifick Gravity of Shells, and I must crave leave to say, Somebody has imposed upon the Dr. in pretending to distinguish between $2\frac{1}{4}$ and $2\frac{1}{8}$ (that is, to the Nicety of $\frac{1}{16}$) in the Gravity of *Conchæ*, *Pectines* and *Cochleæ*; and because Oyster-shells are but $\frac{1}{16}$ lighter than those, they must not be admitted into Sand-stone: on the contrary, I dare aver, it is impossible to determine the Specifick Gravity of *Cochleæ*, for example; and let a Man weigh twenty of them, he shall have near as many different Proportions to determine their relative Gravity upon. For let us only consider, that all of them having a Cavity which is never

never quite full of Water (at leaſt it would never be ſo upon a caſual Subſidence,) unleſs this Cavity, the Quantity of Matter in the Cruſt, and the whole Bulk ſhould bear exactly the ſame Proportion in them all, they muſt weigh differently in proportion to Water. Then we muſt conſider that, when thoſe ſunk, the greater part had their Animals in them; which will make a greater Difference than what is here mentioned: yea, the Animals being dead or alive will make ſome Alteration. But

Secondly, There is no ſuch Rule for the Subſidence of Solids in Fluids as the Dr. pretends; for all Bodies deſcend with equal Celerity, abſtracting from the Reſiſtence of the Medium through which they fall. In Air he may try it, and he will find that a Leaden Bullet, and a Wooden Bullet let fall from the top of the Monument at the ſame time, will likewiſe arrive at the Ground both together, only making the Wooden Bullet bigger than the Leaden one: and in Water, where the Reſiſtence of the Medium is very great, the Deſcent will be regulated as much according to the abſolute as relative Gravity: that is, the greateſt and biggeſt Bo-

dies will deſcend with the greateſt Celerity; for example, a Stone of an hundred weight will fall ſooner to the bottom, than the Powder of the ſame Stone: And, generally ſpeaking, of the Solids heavier than the Fluid, thoſe which contain a greater Quantity of Matter, in reſpect of their Surface, will deſcend faſteſt; as a Globe of Gold ſooner than the ſame Quantity in Leaf: and a Globe of Stone ſooner than a leſſer Globe of Gold, if it contain a greater Quantity of Matter, in reſpect of its Surface, than the Globe of Gold; and yet the Gold has the ſame Specifick Gravity in Leaf and in a Globe, and the Stone a leſs Specifick Gravity than the Gold. The Conſequence of this will be, that the Parts of Animals, which were the greater Solids, could never be buried in Matter of the ſame Specifick Gravity with themſelves: Yea, throw an Oyſter-ſhell into Water, and at the ſame time the conſtituent Parts of the heavieſt Metals, the Shell will fall ſooneſt to the bottom; and where the Depth was ſome hundreds of Miles, as at the general Subſidence, the difference would be conſiderable. By the ſame Rule, the larger Grains of Sand would fall lower than the imperceptible

ceptible conſtituent Parts of other Foſſils.

Thirdly, Granting the Doctor's Rule to be true, it was not obſerved; I do not deny but the *Strata* near the Surface of the Earth look like a Sediment, where ſomething of the Laws of Gravity are obſerv'd. But they will not anſwer the Doctor's Theory, ſo far down as he talks of. There is in *Varenius* an account of the Strata, as they were found, to the Depth of 132 Feet, on the ſinking of a Pit at *Amſterdam*, *viz.* p. 46.

	Feet
Garden Mould	7
Turf	9
Soft Clay	9
Sand	8
Earth	4
Clay	10
Earth	4
Sand, in which the Piles for the *Amſterdam* Buildings are fixed.	10
White Gravel	4
Dry Earth	5
Mud	1
Sand	14

	Feet
Sandy Clay	3
Sand mixt with Clay	5
Sand mixt with Sea-shells.	4
A Clayey Bottom to the depth of	102
Gravel	31

Here it is plain, they are not plac'd according to their different Gravities; for ſometimes the heavier lies uppermoſt; the ſame *Strata* (after the interpoſition of both lighter and heavier ones) are repeated; and ſometimes the Order is retrograde. I think it is very probable they are the Sediment of a Fluid, but not precipitated at the ſame time, *and determin'd to Subſidence in this Order*, merely by *their different ſpecifick Gravities*; on the contrary their Diverſity and Order ſeems rather to perſuade that they were compiled by little and little, and at different times; which, conſidering the Scituation of the Country, is no hard matter to conceive. Something analogous to this I rightly remember is to be found in *Ramazzini*'s Deſcription of the ſinking of the Wells of *Modena*.

Modena. But ſuppoſing thoſe were rang'd, as the Doctor would have them, what is that to a Cruſt 1000 Miles thick? Here it were endleſs to enumerate all the Particulars wherein the Doctor's Rule is violated, theſe following are obvious; 1. *The Precipitation of the lighter vegetable terreſtrial Matter, and burying it among the* Strata, *leaving only ſo much near the Surface, as might ſufficiently ſupply the Wants of humane Nature.* Thus the principal intention of Providence in the Diſſolution of the Earth, was brought to paſs by a Violation of the Law of ſpecifick Gravity. 2. The heavieſt Bodies, we know, are near the Surface of the Earth many hundreds of Miles from the loweſt *Stratum*, which could not have happen'd had the Celerity of their deſcent kept any manner of proportion with their ſpecifick Gravity. 3. Bodies of different ſpecifick Gravities are found buried in the ſame *Stratum*; as Shells and Flint in Chalk. And here I muſt take notice, that it ſeems hard to bury Plants under ground after the Doctor's manner, who does it by affixing Mineral Matter to them: For upon the general Diſſolution, the Plants would get a-top of the Water, and if any ſhould fall in among Minerals, that would buoy

Nat. Hiſt. 90.

buoy them up ſo much the more: For example; I cannot imagin how a Plant that was ſwimming in Water ſhould ſink in a Maſs of Quickſilver. I ſhall conclude with this general Remark; It is ſtrange that the Laws of Gravity, which have been violated in ſo many particulars, in raiſing the Water of the Abyſs, and making a lighter Body, deſcend in its room; in ſuſtaining Minerals in Water, and ſtopping them in their Deſcent before they reach'd the Centre; in placeing the heavieſt Solids in the upper Strata, *&c.* I ſay, it is ſtrange the ſame Laws of Gravity ſhould place a few Shells with as much Nicety, as the Doctor does in his Collection, not tranſgreſſing ſo far as a fifteenth part.

I come now to the effect of this Subſidence, which is the Plainneſs, Paralleliſm, and ſpherical Figure of the Strata; I ſay none of theſe could be true; firſt, They could not be plain; for a ſpherical Surface cannot be ſo; however, that is a Miſtake of a Word, which ſhould be pardon'd. Secondly, They could not be ſpherical: *pag.* 225. The Doctor acknowledges the Earth to be a *Spherois prolatus* (and there is a great difference between a *Sphere* and a *Spharoid*)

roid) and if a *Sphæroid*, the Strata could not be parallel. I ſhall beg leave to add one reaſon why I think they could not be ſmooth a-top, and it is this; *The terreſtrial parts* (according to the Doctor) *ſettled down in or near the ſame places from which they were before taken*; but to make them ſmooth, each ſolid Column, or to ſpeak more properly, each truncated Sector muſt have been of the ſame bulk, and the Matter of the ſame denſity; of the ſame bulk, elſe there would have been outward or inward Inequalities, where there was a difference in Extenſion; and of the ſame Denſity, elſe the ſeveral Columns could not balance themſelves exactly in the ſubſidence, but one would have been higher than another; both theſe would have produc'd Mountains and Vallies. Now ſince there were antediluvian Mountains, it would ſeem that the Columns of the Earth had not been made up of Matter with both the forementiond Properties. And if from the firſt Fluid at the Creation, the Matter had ſettl'd with the inequalities of Mountains and Vallies, I cannot ſee why it ſhould not have done ſo from the Fluid at the Deluge. However this is only a Conjecture. pag. 261.

I have done with Four parts of the Operation; there are *infund. Miſc. diſſolv. præcipit.* And now comes the Fifth, *ſublimetur*; I mean, the Diſlocation of the Strata. Here I ſhall remark, *Firſt*, That it muſt have been a prodigious force that could diſlocate a Cruſt 1000 Miles thick at leaſt (as will follow from my former Reaſoning, concerning the Proportion of the Cavity of the great Abyſs to the ſolid Annulus). *Secondly*, It ſeems wonderful that the Shell of the Bomb ſhould be only crackt and not ſhatter'd to pieces. *Thirdly*, It is next to Impoſſible, that an Agent ſeated within the Cavity of the great Abyſs, at the depth of 1000 Miles, ſhould have been the cauſe of ſo many minute Alterations upon the Surface: Many of the Ruins that appear to us, ſeem to point at Agents far leſs remote. *Fourthly*, It is more miraculous ſtill, that this Globe ſhould be crack'd into the ſame Figure it had before the Deluge, into equal Cavities and Eminencies, and alike ſcituated with thoſe it had then. I grant that the ſteady Hand of the Almighty Creator could do this, and much more; but where was the neceſſity of ſuch a Miracle. The Doctor indeed wants it, elſe

elſe it is impoſſible to ſolve the Identity of the ante-diluvian and poſt-diluvian Geography which *Moſes* ſuppoſes. There muſt be *Piſon, Gihon, Hiddekel,* and *Euphrates* watering the ſame Countries, as well after the Deluge as before; and yet this will not agree with the Doctor's Hypotheſis; for this poſt-diluvian *Gihon* is not numerically the ſame as *Moſes* aſſerts, but a River ſprung up near the ſame place. I wiſh the Compilers of Theories would have more regard to *Moſes*'s Relation, which ſurpaſſes all the accounts of Philoſophers as much in Wiſdom, as it doth in Authority. The Doctor is not ſingular in this, it is but too common a Fault now a-days. Now, I believe it will be hard to reconcile the Doctor's Hiſtory of the Deluge with that of *Moſes*, for theſe Reaſons; *Firſt*, *Moſes* deſcribes the greateſt height of the Water above the Surface of the Earth, to have been after the Inundation, by telling us it was 15 Cubits above the higheſt Mountains. According to the Doctor, its greateſt height was, after the *Subſidence and Diſruption of the Strata* when the whole Maſs of Water lay above them, conſtituting a fluid Sphere, and then to be ſure it was higher by all the

Gen. c. 2.

Gen. 2. 13.

the height of the Mountains: But by what has been ſaid before, it will be found to exceed 450 Miles. *Secondly*, *Moſes* ſeems to attribute a great part of the Inundation to Rain-Water, which was not worthy to be nam'd in reſpect of the whole Maſs of Fluids, enough to diſſolve the terreſtrial Globe. *Thirdly*, *Moſes* and the Doctor differ, as to the manner of the decreaſing of the Waters; for *Moſes* tells us, That God made a Wind to paſs over the Earth, and the Waters aſſwaged; and that the Fountains of the deep were ſtop'd; the Doctor ought to read *open'd*. *Moſes* ſays the Fountains of the Abyſs were ſtopt, that there ſhould no more Water come upon the face of the Earth; and the Doctor ſays that they were opened by the Diſruption of the Strata, to let that which was already upon the face of the Earth, fall back again. *Moſes* tells us the Waters aſſwaged by a Wind, and the Doctor by their retiring into the Cavity of the great Abyſs. *Fourthly*, According to *Moſes*, the ante-diluvian Plants were ſtanding rooted in the ground after the Deluge; at leaſt, one Olive-Tree was ſo. This is ſo inconſiſtent with the Diſſolution of the very uppermoſt Strata, which

Gen. c 8. 1, 2.

which tore up all Plants by the roots; that there was an Olive ſtanding, is plain, elſe a Leaf pluckt off from it by the Pigeon, could be no ſign to *Noah* of the abatement of the Waters; for it was impoſſible to tell by the Leaf whether it was floating or not. I might here add, that it ſeems ſtrange, that of five great Alterations Dr. *Woodward* deſcribes, *Moſes* ſhould mention only the firſt; and, after ſuch a particular Account of the Creation of the Earth, ſhould not take any notice of its no leſs miraculous ſecond Creation. That there ſhould not be ſo much as a word of the wonderful Changes that were tranſacted under Water: How the Mountains had been taken away, and at the end of 150 days reſtored again. Nay, quite the contrary, *Moſes* ſeems to find the Mountains juſt where he left them. They never ſtir'd out of their Place, from the time that they were overflow'd with the Water 15 cubits, till the Ark reſted upon them.

I have one Difficulty remaining concerning the Doctor's Original of Fountains produced by Subterranean Heat, *which evaporates and elevates the Matter of the Abyſs, buoying it up indifferently on every ſide, and towards all parts of the Surface of the Globe.* p. 121.

Globe. It ſeems hard to make Vapour pervade a Cruſt 1000 miles thick. To this the Dr. anſwers, *That it is perforated, and the Water of the Abyſs fills up all theſe Fiſſures as far as the Level of the Ocean, with which it communicates.* But this throws us into a greater Inconveniency; for there being Fountains in every place, to ſay the ſolid Cruſt is ſo perforated, is little better than to ſay it is ſo thin; or, which is worſe, there would be an Arch of 1000 miles thick in ſome places, and hardly three in others: I am afraid ſuch a one would ſoon tumble. The Dr. muſt conſider that this Cupola of his has a prodigious Diameter, and ought to have a proportionable Thickneſs and Solidity. When it has ſo, the Attraction of the Matter above will be conſiderable.

Another thing to be obſerved is, that the Water of the Abyſs being in one Veſſel, the Heat will diffuſe it ſelf uniformly through it all. And a ſwinging Quantity of Heat it muſt be, that will ſet ſuch a Kettle a boyling. But then the Conſequence is, that the Water of the Sea will be heated to, ſince that is one with the Water of the Abyſs: For, according to the Doctor, the Channel of the Ocean, the Cavity of the

the great Abyſs, and the Fiſſures by which they communicate, make but one Veſſel, like a Bottle with a long Neck, and a Funnel join'd to the top of it; and I believe it would be difficult to heat one part of the Water in ſuch a Veſſel without the reſt.

It may be a juſt prejudice againſt the Solidity of the foregoing Objections, that *Steno* a famous Mathematician and Philoſopher is commonly reckon'd the Author of this Hypotheſis: to take off which, I ſhall prove that in thoſe parts that are moſt exceptionable, the Doctor's Philoſophy is different from *Steno*'s. This I cannot do better than by comparing both their Performances, they being the moſt remarkable Philoſophers that have appear'd upon this Subject.

First, *Steno*'s diſſertation was a Prodromus to a greater Work as well as the Doctor's; and he tells you, 'That it was 'a ſuccinct, not to ſay a tumultuary Re- 'lation of the chief things which in the 'Diſſertation it ſelf he intended to explain 'more diſtinctly and more largely; toge- 'ther with a Deſcription of the Places 'where he had obſerved every particular. *Prod. p.* 109. But that the Reader may the better per-

ceive in what they differ, and in what they agree, I thought fit to put those few Paſſages, which I had leiſure at preſent to pick out of both their Writings, in two different Characters, *Steno*'s in Roman, the Doctor's in Italick.

STENO.

Prod. p. 10. In this Argument the Ancients were exerciſed with one only Difficulty, which was, how Marine Bodies came to be left in places remote from the Sea: nor was it ever made a Queſtion amongſt them whether ſuch Bodies came from any place elſe than the Sea.

Dr. Woodward.

p. 67. *The Antients never made any queſtion but that they were the Exuviæ of Shell-Fiſh, and that they once belonged all to the Sea. But the Difficulty was, how they came thither, and by what means they they could ever arrive to places oftentimes ſo remote from the Ocean.*

STENO.

STENO.

Thoſe Bodies not only reſemble one another, but alſo the Parts of the Animals to which they belonged: nor is there any difference in the tendency of the Striæ, the Compoſition of the Lamellæ, the Whirls and Windings of the Cavities, or in the Joinings and Hinges of their Bivalves. In ſome Places there are found ſeveral diſſimilar Oyſter-ſhells, and ſticking together, after the manner they are found at Sea. If ſome Shells are found broken, the Edge of the Fragment demonſtrates that the other was formerly joined to it, which likewiſe is ſometimes found near the ſame place. Since it is ſo eaſie to obſerve when more regular Bodies recede from their uſual Figure, how much eaſier muſt it be to find Defects in Bodies of a much more compoſed Figure; ſuch as *Canis car. p.* 116.

ibid. p. 132.

thoſe are which imitate the Parts of Animals.

In his *Prodromus* he is more particular.

Dr. Woodward.

p. 22. *The Tendency of the Fibres and Striæ the ſame: the Compoſition of the Lamellæ, conſtituted by thoſe Fibres, alike in both: the ſame Veſtigia of Tendons (by means whereof the Animal is faſtened and joined to the Shell) in each: the ſame Papillæ: the ſame Sutures and every thing elſe, whether within or without the Shell, in its Cavity, or upon its Convexity, in the Subſtance or upon the Surface of it. Beſides, theſe Foſſil Shells are attended with the ordinary Accidents of the Marine ones,* ex. gr. *they ſometimes grow to one another, the Leſſer Shells being fixed to the Larger.*

STENO.

STENO.

The Shells that lie under ground may be reduced to three ſorts. The firſt is of thoſe that are ſo like the true ones (*which he had before moſt ingeniouſly deſcribed*) as an Egg is to an Egg; foraſmuch as the Shells themſelves are reſolved into little Shells, and the little Shells into Threads; as alſo the ſame Poſition or Site. *Prod.* p. 81.

That theſe Shells were once the parts of Animals living in a Fluid; tho there never had been ſeen any Teſtaceous Marine Creatures, the very View of the Shell it ſelf evinceth, as may be made evident by the inſtance of Bivalve Cockle-ſhells. *From the Condition of which, he draws ſeveral Concluſions about the manner of their Formation, by a Sagacity peculiar to himſelf.* P. 82.

Dr. Woodward.

That there are vaſt Multitudes of Shells contained in Stone, &c. free from any Mineral Contagion; which are to be match'd by others at this day found upon our Shores, and which do not differ in any reſpect from them, being of the ſame Size that theſe are of, and the ſame Shape preciſely; of the ſame Subſtance and Texture; as conſiſting of the ſame peculiar Matter: and this conſtituted and diſpoſed in the ſame manner as is that of their reſpective Fellow Kinds at Sea, &c.

STENO.

p. 83. The ſecond Sort, is of thoſe Shells, which in the reſt are like to the lately deſcribed ones, but differ from them only in Colour and Weight; in regard that ſome of them are found too light, others too heavy: for as much as theſe have Pores filled up with an adventitious Juice, but the Pores

Pores of those are widened by the expulsion of the lighter Parts.

Dr. Woodward.

They meet with some that were in all p. 18.
appearance Shells: that were of the same Bigness, Figure and Texture with the common Echini, Scallops and Periwinkles; but had notwithstanding Flint, Native Vitriol, Spar, Iron Ore, or other metallick or mineral Matter, either adhering firmly in Lumps to the Outsides of them, or insinuated into their Substance, into their Pores and inner parts, so as to disguise them very much, and give them a Face and Mien extremely unlike to that of those Shells which are at this day found at Sea.

That for the metallick and mineral p. 21.
Matter which sometimes adheres to the Surface of these Shells, or is intruded into their Pores, and lodged in the Interstices of their Fibres, 'tis all manifestly adven-

titious; the mineral Particles being plainly to be distinguished from the testaceous ones, or the Texture and Substance of the Shell, by good Glasses, if not by the naked Eye.

p. 18. *That there were found certain Bodies that bore the Shape and Resemblance of Cockles, Muscles and other Shells, which yet were not really such, but consisted entirely, some of them of Sand-stone, others of Flint, and others of Spar, or some*

p. 20. *other mineral Matter. That the abovementioned Bodies, which consist of Stone, of Spar, Flint, and the like; and yet carry a Resemblance of Cockles, Muscles, and other Shells; were originally formed in the Cavities of Shells of those kinds which they so resemble; these Shells having served as Matrices or Moulds to them.*

STENO.

Prod. p. 84. The third sort is of such as in their Figure alone resemble those that were newly

newly discourſed of, but for the reſt, totally differ from them; ſeeing that in them are to be found neither the little Shells nor the Threads, much leſs the Diverſity of the Threads. Of theſe, ſome are aereal, ſome lapideous of either a black or yellow Colour, others Marbly, others Cryſtalline, others of other Matter. The Production of all which I explain in manner following,

Where the penetrating Force of Juices hath diſſolved the Subſtance of the Shell, the ſame Juices being either drank up by the Earth, have left the ſpaces of Shells void (which I call aereal Shells) or being alter'd by new adventitious Matter; have, according to the Variety of that Matter, filled up the ſame ſpaces of Shells either with Cryſtal, with Marble, or with Stone, &c. *Then he gives an account of a great many Rarities of that Kind, and concludes,* What

p. 87. What hath been ſaid of Shells, the ſame may be ſaid of other Parts of Animals, and of the Animals themſelves buried under ground; of which number are the Teeth of Sea-Dogs, the Teeth of the Fiſh *Aquila*, Fiſhes Back-bones, all ſorts of whole Fiſhes, Skulls, Horns, Teeth, Thigh-bones, and other Bones of Terreſtrial Animals. And

p. 93. What is ſaid of Animals and their Parts ſuiteth likewiſe with Plants, and the Parts of Plants, whether they be digged out of Earthen Beds, or lodg'd within ſtony Subſtances.

Of theſe *Dr. Woodward* obſerves,

N. H. *p.* 275 *That He has never met with ſo much as one Plant that is peculiar to any other Seaſon of the Year than* May.

From

From all which, and a great deal more that I might add, it is plain, 1. that *Steno*'s Obſervations about thoſe Bodies, have been both very full and true, being confirmed by thoſe of Dr. *Woodward*; made perhaps from the beſt Collection of ſuch Curioſities, that has yet been ſeen any where. 2. That *Steno* was very much perſuaded that thoſe were the real *Exuviæ* of Animals, and has made uſe of fit Arguments to convince others. Dr. *Woodward* mentions two indeed, which I do not find in *Steno*: 1. That thoſe Shells anſwer Chymical Tryals: And 2. have the ſame Effect in Medicine when *inwardly adminiſtrated to Animal Bodies.* The firſt of theſe the Learned Dr. *Hook* mentions in his *Micrography*, which was publiſhed before *Steno*'s *Prodromus*, and contains a moſt accurate Deſcription of thoſe marine Bodies. As to the ſecond, I think it of ſo little weight in reſpect of any of the former, that I wonder the Doctor ſhould break his Collection to try thoſe Shells upon his Patients, which he was ſatisfied were genuine before by ocular Inſpection; and I am ſtill more in the dark how he could have diſcovered by the Difference of the Effect, if they had not been genuine. *p.* 110.

As

As to the Theories deviſed to ſolve this Appearance of marine Bodies lodg'd in the *Strata*, *Steno* and the Doctor differ chiefly in theſe two things: 1. *Steno* is not ſo poſitive as the Doctor; for what he has delivered in his *Canis Carchariæ diſſectum caput* he calls only Conjectures, and tells us, that while he ſhews his own Opinion to be probable, he does not charge the Patrons of the contrary one with miſtake; that the ſame Appearance may be ſolved different ways, and that Nature attains her ends in her operations by different means; that it were a very imprudent thing to admit only one as true, and condemn all the reſt. Dr. *Woodward* on the contrary affirms, that, in his Treatiſe of the *Natural Hiſtory of the Earth*, he has deſcribed no Alterations of this Globe, for which we *have not an abſolute and demonſtrative Certainty.* The ſecond Difference is, that Dr. *Woodward* extends the ſeveral Branches of *Steno*'s Theory, and makes them more univerſal. Both theſe will appear by what follows.

Cap. 135.

Nat. Hiſt. p. 74.

Firſt

First, as to the TIME when those marine Bodies were lodg'd there.

STENO.

That there is nothing hinders, but that we may believe the Earth, where these marine Bodies are found, was formerly covered with Water. That from Sacred Writ we learn, That at the beginning of the Creation and the time of the Deluge, all things were so. *He proves it could not be the former*, since that fluid was aqueous at the time when there were yet no Animals nor Plants. That 'tis certain that the Production of many Shells we meet with in our days, is to be referr'd to the Times coincident with the general Deluge.

Can. 115.

Pr. p. 99.

Pr. p. 90.

Dr. Woodward.

That they were not left behind at the beginning of the World, when the Sea over-spread the whole Globe, till its retreat

Nat. Hist 42.

treat into its assign'd Channel ; and that the Waters were gathered together into one place, the third Day from the commencement of the Creation. That those marine Bodies were born forth of the Sea by the universal Deluge ; and that upon the return of the Water back again from off the Earth, they were left behind at Land. That they could never have been put into the condition we now find them, by any such short and partial Agents as those proposed by other Authors.

Nat. Hist. 72.

ibid. 40.

The Difference between the Doctor and *Steno* in this particular is, That though *Steno* admits the Deluge as one, he does not with the Doctor exclude other partial Agents, as Inundations by Earthquakes, *&c.*

Next, as to the MANNER of the Deluge.

STENO.

Pr. 104. It may be explained, if we place about the Fire in the middle of the Earth

Earth a Sphere of Waters, or at leaſt certain Receptacles of them, whence without the motion of the Center, the powring forth of the included Water may be deduced:

That the Water which is undoubtedly in the Bowels of the Earth, was, by the force of the acknowledged ſubterranean Fires, partly driven toward the Springs, and partly thruſt forth through the Pores of the not yet drowned Earth into the Air. *Pr.* 105.

Dr. Woodward.

That there is a mighty collection of Water incloſed in the Bowels of the Earth, conſtituting an huge Orb in the interiour or central Parts of it; upon the Surface of which Orb of Water, the terreſtrial Strata are expanded. That this is the ſame which Moſes *calls the* great Deep, *or* Abyſs. *The antient Gentile Writers* Erebus *and* Tartarus. *Nat. Hiſt.* 117.

This

Nat. Hiſt. 164. *This at the Deluge was brought out upon the Surface of the Globe.*

The Difference between *Steno* and the Doctor in this particular, is, 1. That the firſt endeavours to explain how the Water that was included in the Bowels of the Earth, might be brought upon its ſurface; the other raiſes the Water of Springs much after the ſame manner, but has not yet told us how he raiſes the Water of the Deluge. 2. The Doctor places his ſubterranean Fire above his Waters; but *Steno* his Waters above the Fire.

As to the diſſolution of the ſolid Matter in which thoſe marine Bodies are included, that it was in a ſtate of fluidity at the time of their being lodg'd there, is an evident Propoſition, ſuppoſing them to be genuine; but the different Opinions of the Two Philoſophers, as to this matter, are as follows.

STENO

I hinted in the foregoing Propoſition, that the Earth, in which thoſe Bodies are found, might have been formerly

formerly covered with Water; now I proceed to prove, That the same Earth might have been likewise mingled with the Water. That Land-Floods and the Agitation of Waters by Wind, demonstrate that Sand and Earth may be mix'd with Water; and that it were not hard to prove, that Sand-earth, Sand-stone, and all other kinds of Solids, are oftentimes contain'd in standing and clear Water. That there are two ways how Solids may be contained in Water, *viz.* Either in their Powder or Elements; the former way all sorts of Salts are combin'd with it. That the Elements of Solids may be latent in Water two ways, either really as they are in themselves, or Bodies; which putting on another Figure, are transform'd into these Solids. That it is easie to find the places whence those Solids might have been com-

Cani's Cor. P. 122.

Ibid.

municated to the Water which covered the Earth where those marine Bodies are found. And since it is so, we need not wonder, if either the Powder or Elements of Clay, Gravel, Sand-stone, and other sorts of Stone, were formerly mixed with, and contained in the Water.

Dr. Woodward.

Nat. Hist. p. 29. *That at the Time of the Deluge (when these Shells were brought out upon the Earth, and reposed therein in the manner we now find them) Stone, and all other solid Minerals, lost their Solidity; and that the sever'd Particles thereof, together with those of the Earth, Chalk, and the rest, as also Shells, and all other animal and vegetable Bodies were taken up into, and sustained in the Wa-*
ibid. p. 74. *ter. And, in a Word, That all Fossils whatever, that had before obtain'd any Solidity, were totally dissolv'd, and their constituent*

conſtituent Corpuſcles all disjoin'd, their Cohe-ſion perfectly ceaſing. That the whole ter-reſtrial Globe was taken all to pieces, and diſſolv'd at the Deluge. But *what was the immediate Inſtrument or Means where-by the Stone and other ſolid Matter of the antediluvian Earth was diſſolved and reduced to the Condition mentioned*; the Doctor has promis'd to tell us in his larger Work. Preface. Nat. Hiſt. p. 108.

The Reader may eaſily perceive, that Dr. *Woodward* is 1. more particular as to the Time of this Mixture of Solids and Fluids. 2*ly*. That he has made it more univerſal as to the Subject, extending it to the whole Mass of Solids that conſtitute the Globe; this I muſt needs ſay is the Parent of the numerous Difficulties which preſs the Doctor's Hypotheſis. 3*ly*. *Steno* has given us the Philoſophy of his Mix-ture, but we ſtill impatiently expect the Doctor's. As to the Subſidence, their Opinions are;

STENO.

Can. Car. p. 125. That the Bodies which made the Water turbid, the violent motion ceasing, must have sunk to the bottom. That they were not all of the same gravity: whence it came that the heaviest subsided first; the less heavy subsiding next after; and the lightest floated longest of all nearest the bottom, before they joyned themselves to it: whence, from the same Sediment there would be formed different Strata.

Dr. Woodward.

Nat. Hist. p. 75. *That at length, all the Mass that was thus born up the Water, was again precipitated, and subsided towards the bottom. That the Subsidence happened generally, and as near as possibly could be expected in so great a Confusion, according to the Laws of Gravity: that Matter, Body or Bodies which had the greatest quantity or degree of Gravity subsiding first*

first in Order, and falling Loweſt: that which had the next, or a ſtill Leſſer Degree of Gravity, ſubſiding next after, and ſetling upon the precedent: and ſo on their ſeveral Courſes; that which had the leaſt Gravity ſinking not down till laſt of all, ſetling at the ſurface of the Sediment, and covering all the reſt. That the Matter ſubſiding thus, formed the Strata of Stone, of Marble, of Coal, of Earth, &c.

Here indeed the Doctor in refining upon *Steno*, has fallen into a grievous Miſtake; he will have the Subſidence ordered meerly by ſpecifick Gravity; whereas *Steno* does not exclude abſolute Gravity: for ſpeaking of the Subſidence, he ſays, *Sive enim in aquæ ſuperficie cremoris inſtar concreſcens ſaxea cuticula, ubi gravior reddita fuerit, fundum petat.* I wonder, as I hinted before, the Doctor did not ſee that a Stone of a 100 pound weight could fall ſooner to the bottom than the Powder of the ſame Stone, and for the ſame reaſon Gravel ſooner than ſmall Sand, tho *Can. Car. p.* 130.

they have the ſame ſpecifick Gravity. Another difference between the Doctor and *Steno* in this particular is, that the former aſſerts his marine Bodies to have ſubſided at the ſame time with the Matter in which they were intomb'd: Whereas the latter aſſerts, they were covered by the Sediment.

Now come we to the Doctrine of the Strata; in which *Steno* has been more particular; he tells us,

STENO.

Can. Car. p. 134. That the Earth in many places is compoſed of Strata of different colours lying one upon another; yea, in thoſe very places where the Earth is of one colour, the diverſity of the Strata may be obſerved. That theſe Strata invite us to believe, that they are the Sediment of a Fluid; *Which in his* Prodromus *he proves by ſeveral Arguments*; Firſt, Becauſe it appears not that the duſty Matter of the Beds can have been otherwiſe reduced into

Pr. p. 27.

to that Figure, if it had not by being commixed with ſome Fluid, and falling thence by its own weight, been made plain by the motion of the ſame incumbent Fluid. 2*ly*. Becauſe the greater Bodies contained in the ſame Beds, do for the moſt part obſerve the Laws of Gravity, both as to the ſite of each Body by it ſelf, (*that is parallel to the Horizon, unleſs where the ſituation is varied by that of the Bed*) and as to the ſite of various Bodies among themſelves; (*that is, ranged according to their different degrees of Gravity*).

Dr. Woodward

Tells us, from his Obſervations upon all the Terreſtrial Matter, *That it is naturally diſpoſed into Layers or Strata; ſuch as our common Sandſtone, Marble, Coal, Chalk, all ſorts of Earth, Marl, Clay, Sand, Gravel, with* Nat. Hiſt. pag. 9.

ſome others of this various Matter thus formed into Strata, of which the far greater part of the terreſtrial Globe conſiſts from its ſurface downwards to the greateſt depth we ever dig or mine.

STENO.

Fred. p. 43. That when any Bed was formed, the ſuperiour Surface was, as far as was poſſible, parallel to the Horizon; ſo that all Beds, except the loweſt, were contain'd in two Plains parallel to the Horizon. That he had obſerved the Strata in ſome places divided by perpendicular Fiſſures.

Dr. Woodward.

Nat. Hiſt. f. 10. *That the Stone is divided into Strata by means of horizontal and perpendicular Fiſſures; which he calls ſo, not ſo much with reſpect to the preſent ſite of the Strata, as to its original Situation.*

STENO.

STENO.

That when the Earth had been dryed after the Deluge, its Face did ſhew vaſt Plainneſſes; that Nature demonſtrates that thoſe Plainneſſes did exiſt, and the Scripture contradicts it not. *Prod. p.* 106.

Dr. Woodward.

That the ſaid Strata, whether of Stone, of Chalk, of Coal, of Earth, or whatever other Matter they conſiſted of, were all originally parallel. That they were plain, even, and regular, &c. *Nat. Hiſt. p.* 79.

As to theſe Propoſitions, there are ſeveral Differences between the Doctor's Philoſophy and *Steno's*. The Doctor confines himſelf to the time of the Deluge for the Formation of his Beds; whereas *Steno* tells us, there are ſome extant which have been formed before, and ſome which have been formed ſince. That there are *Beds of ſimple Matter obvious in all Mountains, which* *Prod. p.* 41.

which were formed when the other Beds were not yet extant; but all were covered with a Fluid, deſtitute of Plants and Animals. The Original of theſe he dates from the Creation, and gives admirable Rules for the determining, from the Matter which the Beds contain, the Time and Manner of their Formation; if they were extant at the Creation, or formed ſince; if made by the Sea, Rivers, or Earthquakes, *&c. Steno* aſſerts, There were great Plainneſſes after the Deluge, the Doctor, That the Earth was all plain. *Steno* ſays, *The Diverſity of the Strata almoſt, if not altogether, perſuade us, that they were compiled by little and little:* But the Doctor's *Strata* were formed all at the ſame time, as far down as the Surface of the great Abyſs. The Doctor lays on his *Strata* ſpherically, or at leaſt ſpheroidically, all over the Surface of the Globe, well enough obſerving ſo far the Laws of Gravity. But tho *Steno's* Strata, being but ſmall Portions of that ſpherical Surface, may properly enough be called horizontal, this Epithet will by no means agree to the Doctor's; for when they made entire ſpherical Surfaces, they could no more be denominated *horizontal with reſpect to that Situation*, than *Meridional*

Can. Car. p. 125.

Meridional or *Vertical*, or by any other great Circle of the Sphere.

As to the changed Situation of the Beds,

STENO.

That hence a Cauſe may be given of that Inequality, on the Surface of the Earth, which occaſions many Controverſies. That the changed Situation of Beds, is the chief Original of Mountains. *His Arguments for this are not only convincing, but elegant and fine. viz.* That there are vaſt Plains upon the Tops of ſome; many Beds parallel to the Horizon; on their Sides various Beds variouſly inclined to the Horizon; in the oppoſite Sides of Hillocks the Faces of the broken Beds ſhewing the perfect reſemblance of Matter and Shape, *&c.* That the perpendicular Fiſſures of the *Strata* ſhew that they had been violently ſhaken *Prod. P.* 45.

ſhaken, and broken upon the falling back.

Dr. Woodward.

Nat. Hiſt. p. 90. *That after ſome time the* Strata *were broken on all Sides of the Globe. That all the Irregularities and Inequalities of the Terreſtrial Globe were cauſed by this means. That the natural Grotto's and Rocks, and thoſe Intervals of the* Strata, which in his Obſervations he calls the Perpendicular Fiſſures, *are nothing but theſe Interruptions or Breaches of the* Strata. *That the more eminent Parts of the Earth, Mountains and Rocks, are only the Elevations of the* Strata.

STENO.

Prod p. 105. That what did happen in the Surface of the Earth, whilſt it was covered with Water, neither Scripture nor Nature declareth; this only we may affirm from Nature, that deep Valleys were then produced; becauſe

a

a Return was then to be opened for the Waters into the deeper Parts of the Earth.

Dr. Woodward.

That upon the Disruption of the Strata, and the Elevation of some and the Depression of others of them, which followed after that Disruption, towards the latter end of the Deluge; this Mass of Water fell back again into the depressed and lower parts of the Earth. Nat. Hist. p. 164.

In all these Particulars, 1. The Doctor has delivered his mind more positively and fully than *Steno*. 2. *Steno* produces some Mountains, the Doctor all, at the Deluge. 3. *Steno*'s are produced by partial Agents seated near the Surface; the Doctor's by one seated within the Cavity of the great Abyss. 4. *Steno* tells us what his Agents are; but the Doctor keeps his as a Secret.

I have not leisure to compare their Dissertations in other things, such as the Origine of Springs, which they both bring *from the Sea penetrating into the Hollowness of the Earth*; but more fully explained by

Nat. Hist. p. 133. *Prod. p.* 48.

by Dr. *Woodward*; nor their History of the Effects of Earthquakes, which the Reader may consult at his Leisure. From the Specimen I have given (wherein I have made use of the English Translation of *Steno*'s *Prodromus*) it is plain, 1. That *Steno*'s Hypothesis is not burthened with all the Difficulties of Dr. *Woodward*'s; I will not say it is liable to none. 2. That as Nature shews the same Face to every Man, sagacious Persons will jump strangely as to their Conjectures about her. 3. That tho Dr. *Woodward*'s Hypothesis seems to be liable to many just Exceptions, the whole is not to be exploded; there are a great many things which I question not but he will make out beyond all contradiction; and if he takes off the Objections I have proposed, I'll promise him I am not in the least disposed to cavil. Only I cannot forbear to wish that People were more diligent in observing, and more cautious in System-making. First, the World is malicious, and when they write for an Opinion it spoils the credit of their Observations. They have then taken their Party, and may be suspected for partial Witnesses. In the next place, Mankind, in these Matters, is naturally too rash,

and

and apt to put more in the Concluſion than there is in the Premiſes. Yea, ſome there are ſo fond of an Opinion, that they will take pleaſure to cheat themſelves and would bring every thing to fit their darling Hypotheſis. Then only we may expect to ſucceed in compiling of Theories, when we build upon true and deciſive Obſervations; and ſurvey the Works of Nature with the ſame Geometry (tho in a more imperfect Degree) by which the divine Architect put them together.

FINIS.

A Vindication *of an Abſtract of an* Italian *Book concerning Marine Bodies which are found petrified in ſeveral Places at Land, written by* Agoſtino Scilla, *and abridged in the* Philoſophical Tranſactions *for the months of* January *and* Febr. 169⅝.

To Dr Arbuthnet.

SIR,

SINCE you have at laſt been prevailed upon to oblige the Publick with your Thoughts upon one of thoſe Queſtions which have ſo long and ſo warmly exerciſed the Philoſophical part of Mankind amongſt us; you will not be

surprized to see an account of an incidental Controversie, which I have been unawares engaged in, and which was first occasioned by that Book which you have undertaken to *examine*.

You may remember, Sir, that about two Years ago, there was an Abstract of an *Italian* Book written by *Agostino Scilla*, printed in the *Philosophical Transactions*. It is usual for those Papers which are printed in the Transactions, to be first read before the Royal Society; according to which Custom that Account of *Scilla's* Book was read before them, and they did me the honour so far to approve of it, as to order its Publication. This I suppose they did the more willingly, because the Controversie which *Scilla* undertakes to decide was at that time the Subject of most of the Philosophical Conversations of the *Virtuosi* about the Town. For Dr. *Woodward*, a Member of the *Royal Society*, had not long before printed *An Essay towards the Natural History of the Earth*, as a Specimen of a larger Work; wherein, amongst other things, he undertakes to demonstrate that all those Shells, which are found in the Bowels of the Earth, are *Exuviæ* of once-living Animals. The proving

proving of which Propoſition being likewiſe the Deſign of *Scilla*'s Treatiſe, a Book then very little known in *England*, I thought a large Account of it would not be unacceptable to the Society, and therein, to my great Satisfaction, I was not deceived, which I gladly take this occaſion to acknowledge with Thankfulneſs.

Now it ſo happened, as it always does when Men ſtart new Notions much out of the common Road, that not long after Dr. *Woodward*'s Book appeared, ſeveral Perſons, ſome one way, ſome another, contradicted his *Hypotheſis*. Among other things, ſome objected to him that he ſtole from ſeveral Writers who had appeared already upon the ſame Subject, and from *Scilla* amongſt the reſt. To obviate therefore the Prejudices which theſe Men's Writings might raiſe againſt Dr. *Woodward*'s *Hypotheſis*, Mr. *Harris*, a Member of the *Royal Society* likewiſe, has lately printed *Remarks on ſome late Papers relating to the Univerſal Deluge, and to the Natural Hiſtory of the Earth.* Herein he falls upon Mr. *Robinſon*'s *Additional Remarks to his Obſervations on the Natural Hiſtory of this World of Matter, and this World of Life*, becauſe he does there accuſe Dr. *Woodward* of

ſtealing from *Scilla*, and begs pardon of the World for *referring ſeveral Hypotheſes and Obſervations to Dr.* Woodward, *whereas it ſeems he had taken them from others*, amongſt whom *Scilla* is there reckoned up for one*. Mr. *Harris*'s Words are theſe, † *Then, for the Philoſophical Tranſactions that you cite here, in it is given indeed a ſort of an Abſtract (ſuch a one as it is) of* Scilla's *Book, but would any judicious Perſon charge a Gentleman with being a Plagiary from* Scilla, *by ſeeing only an Abſtract of his Book, and an Abſtract too, liable to ſo many juſt Exceptions, as I can prove that is?*

* *Additional Remarks p.* 1.
† *Remarks p.* 160.

This Charge of Mr. *Harris*'s put me, Sir, upon the neceſſity of reviewing what I had formerly publiſhed concerning *Scilla*'s Book, and of comparing it once more with the Original. I know the Reſpect which I ow to the *Royal Society* too well to impoſe upon them, and as in the Preamble of my Abſtract I had ſaid nothing of Dr. *Woodward* or his Performance, but what was reſpectful, ſo I could not ſee how he or any of his Friends could have any pretence to be diſturbed at it. Whether therefore I have preſented the *Royal Society* with ſuch a fallacious Abſtract, I ſhall now enquire, and then, Sir, leave it to your determination. I need

I need not tell you, Sir, I am ſure, who are ſo throughly verſed in all parts of uſeful Learning, when an Abſtract of a Book that treats of Philoſophical Subjects is faulty, and when 'tis not. You know, Sir, that an Abſtracter ought to lay his Author's chief Deſign fully and clearly before his Reader; if his Author digreſſes, to take notice of it, if his Digreſſions be new and curious, to dwell longer upon them than if they are mean and trivial, in a word ſo to follow him, as that he may be repreſented by his Abſtracter in as fair and full a view as he poſſibly can. This (if the Abridger writes not in his Author's Language) he may do in his own Words, without confining himſelf to a Verbal Tranſlation: if his Author be obſcure, verboſe, or immethodical, he may give his Abſtract with Perſpicuity and Method, ſtill remembring that his Author's *Notions* not his *Words* are the things to which he ought ſtrictly to confine himſelf. The *Philoſophical Tranſactions*, and the *Leipzick Acta Eruditorum*, will afford numerous Inſtances of ſuch Abſtracts as theſe which I have here deſcribed.

Since therefore *Scilla*'s Deſign was to prove the Shells of all ſorts, found in the Bowels of the Earth, to be only *Exuvia* of living Animals, I thought it was enough for me to ſet down the principal Arguments by which he proved it, with a ſhort Account of the Motives which led him to make this Enquiry, and herein to be ſometimes longer ſometimes ſhorter, as the Matter required it. His long-winded Civilities, were only to be hinted at, and that Prolixity which made his Book tedious to me was carefully to be avoided, leſt my Account might have proved tedious to thoſe who might ever have thought it worth their while to look into it.

For that Reaſon I omitted *Scilla*'s Citations out of *Strabo*, * who had obſerved Shells, and pieces of Ships found near the Temple of *Jupiter Hammon*, as alſo his long Diſputes with *Crollius* and *Guillandinus*, together with thoſe *Poſtulata* which every Body is agreed about, and are of courſe preſuppoſed in all ſorts of Philoſophical Diſputes; ſuch as theſe, That we ought to ſtand to our Senſes, Not to give our ſelves to *Hypotheſes*, Not to preſcribe to Nature, and the like.

* *p.* 16, 17.

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In one place indeed * I mention the *Calabrian* for the *Catanian* Coaſt, but that I ſuppoſe will be allow'd of both ſides to be a ſmall Overſight, not worth taking notice of.

* *Philoſ. Tranſ. no.* 219. *p.* 184

Neither have I ſet down every Proof which *Scilla* produces for his Opinion, and yet at the ſame time I dare appeal to Mr. *Harris*, wherein I have omitted any one Argument of moment, upon which *Scilla* himſelf lays any ſtreſs.

Thus, for inſtance, I omit what he ſays of the difference of the ſhape of the *Gloſſopetræ*, which had been urged as an Argument why they could not be real Teeth, ſince, if they had been real Teeth, they would have been more alike; becauſe what I had ſaid of the different morticing of the Shark's Teeth into one another, ſo that a Man might be able to tell, at firſt ſight, which Tooth belonged to which Side or Jaw, as alſo *That he had obſerved every one of theſe things in his Gloſſopetræ, which punctually anſwer in every part to the ſeveral Ranks of the Teeth of Living Sharks*, had ſufficiently taken in the Argument ſo far as I was obliged by my Deſign to take notice of it. And his Argument drawn from the different Teeth of a *Peſce Vacca*

† *ibid. p.* 190.

[a Fiſh, before undeſcribed by Naturaliſts, of the *Dog-kind*] was throughly exemplified in the *2d*, *3d*, *4th*, *5th* and *6th* Figures in that *Tranſaction*, which I got copy'd from *Scilla*'s Draughts, that I might ſhew how wonderfully different the Teeth of the ſame Fiſh may be, as Age and Poſition may alter them.

Scilla's Heſitancy about the Objection of Shells being found in the Heart, *Renes Succenturiati*, and Bladder in human Bodies, was not proper to be obſerv'd: What an Author does not well know how to explain, can be no proper Subject for an Abridger to dwell upon; eſpecially when it had ſo little influence upon his main Deſign. But if I have done *Scilla* an Injuſtice, in omitting this part of his Book, I fear Mr *Harris* has done him a greater, in miſrepreſenting it: *Scilla* was baſhful, and had too great an *imbecillitas frontis*, poſitively to deny what ſo many grave Authors had aſſerted, and therefore is willing to recur to ſome inexplicable Plaſtick Power of Nature in Animal Bodies, tho' when he had ſaid all he could upon the Subject, 'tis plain he disbelievd the Matter of Fact, otherwiſe he would never have ſaid at laſt, *That he could not bring*

bring himſelf to believe, that the Figure of thoſe Shells which are found in Animals, does exactly correſpond with that of the Turbens *and* Conchæ *of the Sea* *. This was an eaſie way of denying the poſitive Aſſertion of his Antagoniſt: So that I cannot ſee how *Scilla* can upon this account be reaſonably charged with being a Perſon *whoſe Eaſineſs and Credulity put him upon the Solution of that which in all likelihood was intended only to banter and abuſe him* †. For it is plain by the words juſt now cited, that it was not *Scilla*'s *Eaſineſs* and *Credulity* which put him upon the Solution of a Sham-*Phænomenon*, but his *good Breeding*, of which he is never ſparing, and which is peculiar to the Gentlemen of that Countrey, which would not ſuffer him flatly to deny what his Adverſary had directly aſſirmed.

Perhaps Mr. *Harris* may object, that I uſe the Expreſſion *The Deluge*, when I enquire into the Reaſon why Shells of one ſort are, generally ſpeaking, moſtly found together; which I pretend that *Scilla* ſolves by *the Motion into which the Waters were put during the Deluge* *; whereby he may pretend, that I would inſinuate, that *Scilla* refers every thing to *Noah*'s *Flood*, which ſays

* Non poſſo darmi a credere nelle dette Lumachine quella eſattiſſima, e correſpondente fattura, che nel Guſcio d'un Turbinetto, o vero Lumachina di Mare godiamo, *p.* 76.

† *Harris*'s *Remarks*, p. 226.

* *Phil. Tran.* n. 219. p. 186.

† *Harris's Remarks*, p. 228.

ſays Mr. *Harris*, the *Author never dream'd of* †. Now beſides that it is plain that I cannot be ſo underſtood, ſince I call it only *a Deluge* in another place, where I ſay from my Author in the ſame Page, *that the repeated flowings and ebbings of the Water happened during ſome one very great Inundation, the Time whereof, or its Cauſe he does not determine* †. I ſay, beſides this, which ſufficiently vindicates my uſe of the word *Deluge*, which is no Term of Art appropriated to *Noah*'s Flood, but ſignifies any great Inundation, unleſs the Senſe or ſome limiting Epithet determines it ſo to be underſtood; Mr. *Harris* ſeems inconſiſtent with himſelf, when in one Page he ſays, *'Tis plain that* Scilla *never dream'd of the univerſal Deluge*, and in the very next Page introduces *Scilla* ſaying, *That he does not know whether theſe Shells were repoſited in the Earth in the univerſal Deluge, or in ſome other particular Inundations* *.

† *Phil. Tranſ.* n. 219. p. 191.

* *Harris's Rem.* pag. 229.

This brings me to the mighty Charge, to that *Exception*, (*juſt* or *unjuſt*) which Mr. *Harris* takes at my Abſtract of *Agoſtino Scilla*; and that is, my uſing the Expreſſion *Specifick Gravity*, which our Author *no where uſes, nor the thing deſign'd by it* †, (if we may believe Mr. *Harris*) in

† *ib.* p. 236.

all

all his Book. And here, Sir, I do willingly acknowledg, that *Scilla* never applys the Term *Specifick* to *Gravity*; nay, I am not sure whether he knew the difference between *Absolute* and *Specifick Gravity*; which last is an Epithet which has not been long of frequent use, and was (as I believe) first brought into fashion upon the introducing Hydrostaticks into Natural Philosophy, which necessarily obliged Men to consider not barely the *absolute* or *simple Weight* of Bodies, when tryed in a pair of Scales, but their *relative Weight*, which they have when compared with one another. *Scilla* seems to have been unacquainted with the new Authors and Discoveries in Physicks, and so 'tis no wonder if he uses not their Terms. But since this is so common a Term, and so well understood, I could not imagin how I should do either *Scilla*, or any body else, any wrong, if I used it in my Abstract, provided *the Thing designed by it* were also *designed* by my Author.

You know very well, Sir, that *Specifick*, when apply'd to *Gravity*, is an improper word, not signifying what at first sight it seems to import: For thereby the *comparative* and *relative* Gravity of Bodies is usually under-

underſtood. Water being a Body very manageable, and eaſily to be come at, is the uſual Standard by which the *relative* or *ſpecifick* Gravity of other Bodies is tryed; and the difference of a Body's weight in Air and Water being equal to the weight of a quantity of Water equal in bulk to the Body weighed; the proportion of the weight of this Body to that of Water is hereby determined; if the Proportion which the weight of Water bears to that of Gold, be as 1 to 19, and the Proportion of the weight of Water to that of Silver be as 1 to 10,5; then by the Proportion which Gold and Silver bear to Water, we know the Proportion they bear to one another; by which Proportion we know their *Specifick Gravity*; Tho in mathematical ſtrictneſs this Term is egregiouſly miſ-applyed; for *Species* being only a Logical Term, and every individual, having its peculiar Texture as well as its peculiar Subſiſtence, it may be queſtion'd, whether there be two Lumps of any ſpecies of Metal or Mineral drawn from different Mines or Quarries, which have exactly the ſame *Specifick Gravity*. Mr. *Collins* has given us the *Comparative Gravity* of eight pieces of Gold, and three

pieces

pieces of Braſs, which he weighed himſelf, all which differed very conſiderably from one another *. Had theſe eleven pieces all of a bulk been put together into a Maſs of fluid Mud, and there jumbled with a confuſed violent Motion, this Maſs upon the ceaſing of the motion, which kept it in its fluid ſtate, would have let fall all thoſe heterogenous Bodies which were heavier than it ſelf; and then theſe metalline Lumps would have ſubſided in order, according to their different Gravities, if the Figure of every piece would have allow'd it.

* *Phil. Tr.* n. 199. p. 694.

Tho, Sir, I do own, that what *Scilla* ſays is not inconſiſtent with the Laws of *Abſolute Gravity*; ſince it is certain, that if two Bodies be alike ſpecifically heavy, but of a different Abſolute Gravity, the abſolutely heavieſt Body ſuppoſing their Figures to be ſimilar, will deſcend with the greateſt Celerity: But yet this does not at all exclude *that difference in Subſidence, which Specifick Gravity would alſo cauſe*; for of Bodies of the *ſame* bulk and figure, and of *different* Specifick Gravities, that Body which has the greateſt Specifick Gravity, will *alſo* deſcend the faſteſt: So that *Scilla*'s

Acount

Account will *ſtrictly include* Specifick Gravity, and conſequently I did him no wrong ſo to expreſs his Deſcription of the *Meſſineſe* Hills, as would in common ſpeech be beſt underſtood.

Mr. *Harris* ought not to have excepted to what I had ſaid, ſince Dr. *Woodward* ſays the very ſame thing that I have done, [*Eſſay* p. 75.] *This Subſidence*, ſays he, *happen'd generally, and as near as poſſibly could be expected in ſo great a Confuſion, according to the Laws of Gravity: That Matter, Body or Bodies, which had the greateſt quantity or degree of Gravity* [*i. e.* the heavieſt] *ſubſiding firſt in order, and falling loweſt*: [i corpi di maggior peſo ſotto] *that which had the next, or a ſtill leſſer degree of Gravity, ſubſiding next after, and ſettling upon the precedent*: [i meno gravi ſopra] *that which had the leaſt Gravity ſinking not down till laſt of all, ſettling at the ſurface of the Sediment, and covering all the reſt.* [ſopra di queſti i piu leggieri] It's true, the Doctor reſtrains this Subſidence afterwards *merely* to *Specifick Gravity*, wherein he is miſtaken; but had he kept to *Scilla*'s general Expreſſion (which fully includes it) it had been more Philoſophical.

Since

Since therefore I explained what had been alike expreſſed both by *Scilla* and Dr. *Woodward*, after Dr. *Woodward*'s manner, (only not directly excluding the Laws of *Abſolute Gravity*, which *Scilla* takes in joyntly with thoſe of *Specifick*) the Doctor's Defender has no reaſon to find fault with my Account: At leaſt, if it may in ſtrictneſs be thought *defective*, it cannot be ſaid to be *erroneous*.

It is plain therefore, that when *Scilla* talks of Bodies ſubſiding in a Fluid, *according to their weight*, he may by this *weight* be probably ſuppoſed to mean *Specifick Gravity*, as 'tis commonly called in oppoſition to *Abſolute*; for if they were of the ſame *Specifick Gravity* with Water, they would lie in any part, top, middle, or bottom, where they were placed at firſt; and the reaſon why one thing immers'd in Water ſinks ſooner than another, is, becauſe being not only heavier than Water *ſpecifically* but *abſolutely* at *leaſt*, if not *ſpecifically* heavier than that other Body that ſwims along with it, it proportionably gravitates more, and is leſs hindred in its deſcent by the Reſiſtance of the ambient Water, than that other Body is. If therefore *Scilla* ſays that the *heavieſt*

Bodies

Bodies lay loweſt, it implies that Bodies of a *different Gravity*, *abſolute* or *ſpecifick*, once ſwam together in the Water, and tho he may not underſtand the ſeveral Acceptation of the Terms *Abſolute* and *Specifick*, when applyed to *Gravity*, yet he means the ſame thing with thoſe that do, and would have expreſſed himſelf in the ſame manner had it been the faſhion.

Wherefore when *Scilla* poſitively diſtinguiſhes from his own Obſervation, between the Ranges of the Strata of the *Gravel* and *Sand* in the Hills about *Meſſina*, and when he directly ſays that the *Heavieſt fell lowermoſt*, he is thus to be underſtood *: That theſe Particles of *Sand* and *Gravel* ſubſided at all, was due to their being ſpecifically heavier than the Water

* *Scilla*, (p. 66.) gives this *Deſcription of the Hills near*

Meſſina: Sono eglino per lo più queſti noſtri monti di Ghiaie, rene Mezzane, e minutiſſime, rialzatè a tale ſegno, che ſovraſtano modeſtamente alla Città, che vagamente coronano: L'Ordine della loro Compoſizione è queſto, cioè, *un ſuolo di Ghiaie, à cui s'aggiugne l'altro di Rene ordinarie, e ſopra di queſto il Terzo di minutiſſime rene*; e cio con ordinanza continuata, perciocchè di nuovo ſopra la ſottile Rena ſcorgeſi raſſettata la Ghiaia, e Suſſeguentemente ſino alla Sommità: ——Quel che oſſervo con iſtupore, ſi è, il vedere replicato più e più volte l'Ordine delle Rene groſſe, mezzane, e minute: Ed e forza conchiudere, che con piu cappate di Materia foreſtiera foſſero ridotte alla Grandezza, che li Veggiamo. *Which Deſcription I abridged thus*; (*Tranſact.* p. 191.) The Mountains near *Meſſina* conſiſt of Strata, which ly in this order, *firſt Gravel, then mixed*

midling Sand, then very fine Sand. —That after three Layers of Sand and Gravel of different fineneſſes, come three other Layers in the ſame order with the former; firſt Gravel, then coarſer, then finer Sand again, and ſo on ſeveral times one after another.

The manner how they came to be thus formed, Scilla *deſcribes thus,* (p. 127.) Eglino [i torrenti] ſecondo la Piena dell' Acque, portano con eſſo loro quel, che incontrano; in luoghi però, ove poſſono dilatarſi, perdendo la ferocia del Corſo loro le acque, poſano e diſcaricano i corpi involti in quel fluido, e ſtraſcinati dall' Impeto, *ma con un' Ordine neceſſario,* cioè, *i corpi di maggior peſo ſito, i meno gravi ſopra, e ſopra di queſti i piu leggieri*; il qual Ordine ſarà replicato dalla cagione medeſima più, e più volte, ſecondo le pioggie, che con intervallo mancano, e ricominciano. Or, da cio Jo cavo la ragione di determinare la materia, foreſtiera che le noſtre Montagne compone; e certamente elle piantate furono nel ſito in cui le ſcorgiamo, da una qualche grandiſſima inundazione, la quale ſecondo la Piena, ed il Repoſo, aveſſe portato, e rilaſciato il Peſo più, e più volte ondeggiando. *This I gave in ſhort in* Engliſh *thus,* (p. 191.) This he ſuppoſes to have proceeded from repeated Tides; from whence he concludes, that the Water coming with great violence, ſuſtained whatſoever came in its way; but upon its going off, the force abating, *it let fall the terreſtrial Matter that ſubſided according to its ſpecifick Gravity*; and that theſe repeated Flowings and Ebbings of the Water happen'd during ſome one very great Inundation, *&c. What* Scilla *ſays, was done by a neceſſary Order,* that is to ſay, The weighteſt Body lowermoſt, the leſs weighty above them, and the lighteſt uppermoſt, *I render* was done by Specifick Gravity, *which, to any Man that knows what* Specifick Gravity *means, includes the ſelf-ſame thing.* Only I muſt own, that what I call *Repeated Tides*, ſhould have been rendred *Repeated Floods.*

wherein they were rolled, but that they ſhould obſerve a determinate Order in their Subſidence, which Order, *Scilla* himſelf obſerves, was probably due to their being ſome ſpecifically heavier than others;

and had the *middling* and *very fine Sand* been abſolutely æquiponderant with the *Gravel*, they would have been caſually interſpers'd.

Mr. *Harris* is ſo very ſenſible of the Truth of this Reaſoning, that after he had poſitively declared that *Scilla has not the thing deſigned by ſpecifick Gravity once in all his Book*; he ſays in the ſame page that *Scilla's Notion of the largeſt and moſt ponderous Bodies ſettling loweſt is ſo groſs a Miſtake, that 'tis ſtrange he could ever fall into it.* First he ſays *Scilla never intended to aſſert, That the Subſidence in the Inundations he ſpeaks of was according to ſpecifick Gravity*, and then he *wonders how Scilla could ever aſſert that it was, the thing it ſelf being ſo groſs a Miſtake.* This, Sir, needs not to be enlarged upon

p. 236.

And with this I ſhall conclude what I had to ſay in defence of the Abſtract of *Scilla*'s Book, which was never deſigned for a juſt Tranſlation. I dare appeal to you, Sir, whether *Scilla* did not reſolve the Subſidence of the *Strata*, by that which you and I, Sir, know does not exclude the ſpecifick Gravity of thoſe ſeverall Bodies that compoſed them. Yea, tho the *Gravel*, *middling Sand*, and *fine Sand*, are here in *England*, as far as Mr. *Harris* has tryed

tryed them, alike ſpecifically heavy, which I will not diſpute; yet it proves nothing againſt what *Scilla* has aſſerted. Mr. *Harris* knows every thing is an Individual in Nature; unleſs he had weighed the *Meſſineſe* Sand, he could not be poſitive: and tho *Scilla* be no Philoſopher, yet he is a Painter, and ſuch Men uſually have pretty quick Eyes, and can tell whether *fine Sand* or *Gravel* lies uppermoſt, when they view the broken Cliff of a Hill.

The other Diſpute which Mr. *Harris* is engaged in is nothing to my purpoſe: whether Dr. *Woodward* has taken from *Scilla* or no concerns not me, who never ſaid he did. Perhaps he never ſaw the Book till after he had ſeen the Abſtract. Thoſe that have read his Eſſay and *Scilla*, even in this Abſtract, will be able to judge how uſeful *Scilla* might have been to him had he conſulted him. Our *Italian* clearly proves that the various *Echini*, *Gloſſopetræ*, *Baſtoncini di San Paolo*, *Oyſter-ſhells*, *Cockles*, *Turbens*, *Scallops*, *&c.* which were found in the Hills of *Sicily* and *Calabria*, and in *Malta*, were actually *Exuviæ* and Spoils of thoſe Marine Bodies which they reſembled: and this he ſhews by comparing them with their Originals with great Niceneſs. To a Man who lives in *Eng-*

land, where many of those Animals are rarely if ever seen, such Hints are of great use. And tho an Author is doubtful and reserved in his Solutions of these perplex'd Phœnomena; yet when he is sure of his Conclusions, and gives good and substantial Reasons why he is so, his Observations will be valuable to all those who write upon that Argument, let their own Stock of Observations be never so great. If Dr. *Woodward* received his first notice of *Scilla* from my Abstract, (as I had *then* reason to believe, since he never quoted nor named him in his Essay) I *shall* think I did him a Kindness; and tho Mr. *Harris* seems to insinuate the contrary, yet I shall suppose that Dr. *Woodward* himself thinks I have obliged him, because he will be sensible that he is not singular, and it is a Pleasure to every inquisitive Man to find that other Men, by the same Assistances of Nature and Observation, have made the same Conclusions with himself. I am

SIR,

Dec. 1. 1697. *Your most affectionate Friend, and humble Servant*

W. W.